IN THE CLAIMS:

A complete listing of all the claims is now presented.

Claim 1. (Cancelled).

Claim 2. (Cancelled).

Claim 3. (Currently Amended).

The method according to ~~claim 17~~ claim 19,

wherein the exchange of the catalysts or the variation of the amount of mass or exchange and variation in the sections (d), (g), and (j) takes place using a numerical random-check generator.

Claim 4. (Original).

The method according to claim 3, wherein the program codes G05CAF, G05DYF, G05DZF and G05CCF of the NAG Library (NAG FORTRAN Workstation Library, NAG Group Ltd., 1986) of a numerical random-check generator are used.

Claim 5. (Currently Amended).

The method according to ~~claim 17~~ claim 19,

wherein the number n_1 varying in their quantitative composition or chemical composition or quantitative and chemical

composition ranges from 5 to 100.

Claim 6. (Currently Amended).

The method according to ~~claim 17~~ claim 19,

wherein the selection number n_2, n_3, or n_{n+1} measures 5 to 30% of the number n_1.

Claim 7. (Currently Amended).

The method according to ~~claim 17~~ claim 19,

wherein the main components are selected from the group comprised of Mg, Ca, Sr, Ba, Y, La, Ti, Zr, V, Nb, Cr, Mn, Tc, Re, Fe, Ru, Os, Co, Rh, Ir, Ni, Pd, Pt, Cu, Ag, Au, Zn, Cd, Hg, B, Al, Ga, In, C, Si, Sn, Pb, N, P, As, Sb, Bi, S, Se, Te, F, Cl, Ce and Nd.

Claim 8. (Currently Amended).

The method according to ~~claim 17~~ claim 19,

wherein the mole fractions b_1 .. b_j range from 0 to 50 mole-%.

Claim 9. (Currently Amended).

The method according to ~~claim 17~~ claim 19,

wherein catalyst mixtures are prepared by mixing salt solutions of elements of components A^1 .. A^i, B^1 .. B^j, D^1 .. D^k

and T^1 .. T^l followed by thermal treatment in the presence of a reactive or inert gas phase (tempering) or by jointly precipitating sparingly soluble compounds followed by tempering or by exposing support component T^1 .. T^l to salt solutions or gaseous compounds of the components A^1 .. A^i, B^1 .. B^j, D^1 .. D^k followed by tempering,

wherein the employed salts are nitrates, sulfates, phosphates, carbonates, halogenides, oxalates, carboxylates, or mixtures thereof or carbonyl compounds or as acetyl acetonates.

Claim 10. (Currently Amended).

The method according to ~~claim 17~~ claim 19,

wherein the catalytic reaction is carried out with liquid, evaporated, or gaseous reactants.

Claim 11. (Currently Amended).

The method according to ~~claim 17~~ claim 19,

wherein the reactants for the catalytic reaction are supplied to several reactors and the product stream exiting the reactors is separately analyzed for each individual reactor.

Claim 12. (Previously Presented).

The method according to claim 11,

wherein the catalytic reaction is performed by series-

connecting or arraying 5 to 1,000 reactors comprised of spaces with catalytically active material,

wherein the diameter of these spaces measures 100 μm to 10 mm, and the lengths measure 1 mm to 100 mm.

Claim 13. (Previously Presented).

The method according to claim 11,

wherein the throughput of reactants is selected for a preset reactor length in such a way as to achieve the desired degree of conversion.

Claim 14. (Previously Presented).

The method according to claim 11,

wherein the reactor is a monolithic block with several parallel channels, which can be closed selectively at the inlet or outlet side individually or in a larger number even during the catalytic reaction, or a porous module having channels extending preferably parallel to the flow direction of the reaction mixture, whose channels can be closed at the inlet or outlet side individually or in a large number even during the catalytic reaction.

Claim 15. (Currently Amended).

The method according to ~~claim 17~~ claim 19,

wherein the reactants for the catalytic reaction are supplied to the reactors and wherein the composition of the product streams exiting the reactors is analyzed by a measuring sensor, wherein the measuring sensor is guided two-dimensionally across the exit cross-section of all reactors or the reactors are moved two-dimensionally relative to the measuring sensor and the portion of the product streams received by the measuring sensor is supplied to the analytical device.

Claim 16. (Cancelled).

Claim 17. (Cancelled).

Claim 18. (Cancelled).

Claim 19. (Currently Amended).

A method for ~~producing active and/or selective~~ developing solid catalysts for a heterogenous catalytic reaction ~~of inorganic or organometallic materials or mixtures thereof~~ comprising the steps of:

(a) preparing a first generation of catalysts having a number n_1 of solid catalysts from a substance library of catalytic materials by selecting and introducing catalytic materials into a

substance library, which have already been described or are known or have been determined empirically or intuitively for an individual reaction step of the heterogeneous catalytic reaction under consideration, wherein by a random selection arbitrary mixtures from the elements of the substance library are produced and wherein the catalysts are in the form of compounds of the formula (I)

$$\left(A^1_{a_1}..A^i_{a_i}\right)-\left(B^1_{b_1}..B^j_{b_j}\right)-\left(D^1_{d_1}..D^k_{d_k}\right)-\left(T^1_{t_1}..T^l_{t_l}\right)-O_p \qquad \text{(I)}$$

wherein A^1 .. A^i is a number i of different main components which are selected from the elements of the PTE, excluding trans uranium and noble gas elements, and the number i is between 1 and 10, B^1 .. B^j is a number j of different minor components selected from the group of the elements Li, Na, ~~Ka~~ K, Mg, Ca, Sr, Ba, Y, La, Ti, Zr, V, Nb, Cr, Mn, Tc, Re, Fe, Ru, Os, Co, Rh, Ir, Ni, Pd, Pt, Cu, Ag, Au, Zn, Cd, Hg, B, Al, Ga, In, C, Si, Sn, Pb, N, P, As, Sb, Bi, S, Se, Te, F, Cl, Ce and Nd, and the number j is between 1 and 10, D^1 .. D^k is a quantity k of different doping elements selected from the group of the elements Li, Na, ~~Ka~~ K, Mg, Ca, Sr, Ba, Y, La, Ti, Zr, V, Nb, Cr, Mn, Tc, Re, Fe, Ru, Os, Co, Rh, Ir, Ni, Pd, Pt, Cu, Ag, Au, Zn, Cd, Hg, B, Al, Ga, In, Si, Sn, Pb, N, P, As, Sb, Bi, S, Se, Te, F, Cl, Ce and Nd and the number k is between 1 and 10,

T^1 .. T^l is a number l of different support components which are comprised of oxides, carbonates, carbides, nitrides, borides of the elements Mg, Ca, Sr, Ba, La, Zr, Ce, Al, Si or a mixed phase of two or more thereof, and the number l is between 1 and 10, and O is oxygen, $a_1..a_i$ are identical or different mole fractions of 0 to 100 mole-% with the provision that the mole fractions

$a_1..a_i$ cannot all be 0 at the same time,

b_1 .. b_j are mole fractions of 0 to 90 mole-%,

d_1 .. d_k are mole fractions of 0 to 10 mole-%,

t_1 .. t_l are mole fractions of 0 to 99.99 mole-%,

p is a mole fraction of 0 to 75 mole-%, wherein the sum of all mole fractions

$a_i + b_j + d_k + t_l$ may be not greater than 100 %, and

the number n_1 of catalysts with different quantitative composition or different chemical composition or different weight and chemical compositions is in the range of 5 to 100,000; and determining the fitness of the catalysts experimentally according to the activity or selectivity or activity and selectivity of the 1st generation catalysts for a given catalytic reaction in a reactor or in several series connected reactors;

(b) selecting a number y_{n+1} of catalysts of n^{th} generation according to the highest activities for a catalytic reaction or the highest selectivities for the desired product and product mixture or the highest activity and selectivity of all 1st to n^{th}

generation solid catalysts, wherein the number y_{n+1} is 1 to 50 % of the number n_n, where n is finite;

(c) preparing a n_{n+1}-th generation of solid catalysts from the selected y_{n+1} catalysts, wherein n_{n+1} new catalysts of the general formula (I) with A, B, D, T, a, b, d and t and p as defined under (a) are generated by:

- randomly selecting at least two respective catalysts from the number y_{n+1} of catalysts, wherein all catalysts have the same ~~with a~~ probability $W_{cat}= (y_{n+1})^{-1}\bullet 100\%$ of selection, and selecting at least one component of the selected at least two catalysts, respectively, wherein each catalysts component A^i, B^j, D^k and T^l has ~~with a pre-set~~ the same probability of selection ~~W for each of the catalysts components~~ $W_A=(i\bullet y_{n+1})^{-1}\bullet 100\%$, $W_B=(j\bullet y_{n+1})^{-1}\bullet 100\%$, $W_D=(k\bullet y_{n+1})^{-1}\bullet 100\%$, $W_T=(l\bullet y_{n+1})^{-1}\bullet 100\%$ as every other component from the same group of catalyst components, respectively ~~using a computerized random-number generator~~; and
- performing at least one of the steps of:

  exchanging the selected components between the selected at least two respective catalysts to form new catalysts, and randomly varying a substance amount a_i, b_j, d_k and t_l of a catalyst component A^i, B^j, D^k and T^l which is randomly selected, wherein each catalysts component has ~~with a~~ the same probability of selection $W_A=(i\bullet y_{n+1})^{-1}\bullet 100\%$, $W_B=(j\bullet y_{n+1})^{-1}\bullet 100\%$,

$W_D=(k\bullet y_{n+1})^{-1}\bullet 100\%$, $W_T=(l\bullet y_{n+1})^{-1}\bullet 100\%$ as every other component from the same group of catalyst components, respectively, for at least one of the selected catalysts by determining new values for the corresponding mole fractions within the limits defined under (a) ~~using a computerized random-number generator~~;

(d) determining a fitness of the catalysts experimentally by measuring the activity or selectivity or activity and selectivity of the $(n+1)^{th}$ generation of catalysts for a given catalytic reaction in a reactor or in several series connected reactors;

(e) performing the selection of catalysts according to step (c), the preparation of a new catalyst generation according to step (d), and the determination of a fitness function according to step (e) until a catalyst generation is obtained, for which the fitness compared to the preceding generations is either not increased, or no longer significantly increased as an arithmetic mean.

Claim 20.(New)

A method for developing solid catalysts for a heterogenous

catalytic reaction comprising the steps of:

(a) preparing a first generation of catalysts having a number n_1 of solid catalysts from a substance library of catalytic materials by selecting and introducing catalytic materials into a substance library, which have already been described or are known or have been determined empirically or intuitively for an individual reaction step of the heterogeneous catalytic reaction under consideration, wherein by a random selection arbitrary mixtures from the elements of the substance library are produced and wherein the catalysts are in the form of compounds of the formula (I)

$$\left(A^1_{a_1}..A^i_{a_i}\right)-\left(B^1_{b_1}..B^j_{b_j}\right)-\left(D^1_{d_1}..D^k_{d_k}\right)-\left(T^1_{t_1}..T^l_{t_l}\right)-O_p \qquad (I)$$

wherein A^1 .. A^i is a number i of different main components which are selected from the elements of the PTE, excluding trans uranium and noble gas elements, and the number i is between 1 and 10,

B^1 .. B^j is a number j of different minor components selected from the group of the elements Li, Na, K, Mg, Ca, Sr, Ba, Y, La, Ti, Zr, V, Nb, Cr, Mn, Tc, Re, Fe, Ru, Os, Co, Rh, Ir, Ni, Pd, Pt, Cu, Ag, Au, Zn, Cd, Hg, B, Al, Ga, In, C, Si, Sn, Pb, N, P, As, Sb, Bi, S, Se, Te, F, Cl, Ce and Nd, and the number j is between 1 and 10,

D^1 .. D^k is a quantity k of different doping elements selected

from the group of the elements Li, Na, K, Mg, Ca, Sr, Ba, Y, La, Ti, Zr, V, Nb, Cr, Mn, Tc, Re, Fe, Ru, Os, Co, Rh, Ir, Ni, Pd, Pt, Cu, Ag, Au, Zn, Cd, Hg, B, Al, Ga, In, Si, Sn, Pb, N, P, As, Sb, Bi, S, Se, Te, F, Cl, Ce and Nd and the number k is between 1 and 10,

T^1 .. T^l is a number l of different support components which are comprised of oxides, carbonates, carbides, nitrides, borides of the elements Mg, Ca, Sr, Ba, La, Zr, Ce, Al, Si or a mixed phase of two or more thereof, and the number l is between 1 and 10, and O is oxygen, $a_1..a_i$ are identical or different mole fractions of 0 to 100 mole-% with the provision that the mole fractions

$a_1..a_i$ cannot all be 0 at the same time,

b_1 .. b_j are mole fractions of 0 to 90 mole-%,

d_1 .. d_k are mole fractions of 0 to 10 mole-%,

t_1 .. t_l are mole fractions of 0 to 99.99 mole-%,

p is a mole fraction of 0 to 75 mole-%, wherein the sum of all mole fractions

$a_i + b_j + d_k + t_l$ may be not greater than 100 %, and

the number n_1 of catalysts with different quantitative composition or different chemical composition or different weight and chemical compositions is in the range of 5 to 100,000; and determining the fitness of the catalysts experimentally according to the activity or selectivity or activity and selectivity of the 1st generation catalysts for a given catalytic reaction in a reactor or in several series connected reactors;

(b) selecting a number y_{n+1} of catalysts of n^{th} generation according to the highest activities for a catalytic reaction or the highest selectivities for the desired product and product mixture or the highest activity and selectivity of all 1^{st} to n^{th} generation solid catalysts, wherein the number y_{n+1} is 1 to 50 % of the number n_n, where n is finite;

(c) preparing a n_{n+1}-th generation of solid catalysts from the selected y_{n+1} catalysts, wherein n_{n+1} new catalysts of the general formula (I) with A, B, D, T, a, b, d and t and p as defined under (a) are generated by:

- randomly selecting at least two respective catalysts from the number y_{n+1} of catalysts, wherein all catalysts have the same probability W_{cat} of selection, and selecting at least one component of the selected at least two catalysts, respectively, wherein each catalysts component A^i, B^j, D^k and T^l has the same probability of selection W_A, W_B, W_D, W_T as every other component from the same group of catalyst components, respectively ; and
- performing at least one of the steps of:

exchanging the selected components between the selected at least two respective catalysts to form new catalysts, and randomly varying a substance amount a_i, b_j, d_k and t_l of a catalyst component A^i, B^j, D^k and T^l which is randomly selected for at least

one of the selected catalysts by determining new values for the corresponding mole fractions within the limits defined under (a), wherein each catalysts component has the same probability of selection W_A, W_B, W_D, W_T as every other component from the same group of catalyst components, respectively;

(d) determining a fitness of the catalysts experimentally by measuring the activity or selectivity or activity and selectivity of the $(n+1)^{th}$ generation of catalysts for a given catalytic reaction in a reactor or in several series connected reactors;

(e) performing the selection of catalysts according to step (c), the preparation of a new catalyst generation according to step (d), and the determination of a fitness function according to step (e) until a catalyst generation is obtained, for which the fitness compared to the preceding generations is either not increased, or no longer significantly increased as an arithmetic mean.